



# Article Does the Differentiation of China's Land Policy Promote Regional Economic Development?

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Abstract: The land factor in China still has many distortions which are the key constraints to economic development. The government intervention in land prices is the root cause of distortions in land factor. So, how to achieve the optimization land utilize through policy guidance is one of the most important issues. Using China's city panel data from 2010 to 2020, this study assesses the economic impacts of the inter-provincial transfer of construction land indicators by synthetic difference-indifferences method and estimates the growth effect and equilibrium development effect of the policy, respectively. The results show that first, the differentiation of the land policy will give more land indicators to the backward regions, so that the local governments can obtain more land concession opportunities; thus, a more obvious "land finance" is formed and local economic growth is promoted; second, the differentiation of the land policy fails to promote the balanced development between regions, further expanding the development differences between regions. The findings of this study not only provide countermeasure suggestions for the area in China but can also be applied to many developing countries, especially those which are rapidly developing, to help the development of poor regions through targeted fiscal transfer policies.

Keywords: land policy; regional economic development; uneven development; DID



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# 1. Introduction

In the decades since the reform and opening-up, China has experienced accelerated urbanization and industrialization, and the rate and duration of GDP growth have been described as "economic miracles". However, China's "growth miracle" did not have the advantages of natural resource endowment and physical and human capital accumulation [1], and scholars have tried to investigate the causes of the miracle. One idea is that China's economic growth was achieved through the upgrading of the resource factor allocation structure and the improvement of the market mechanism [2], which is the result of the appropriate development strategy choice and the timely economic reform under the theory of comparative advantage. Another line of thought argues that China's economic development was dominated by government actions with growth-promoting characteristics significantly different from the neoclassical hypothesis and those of other developing country governments; thus, China became a miracle worker [3].

From the perspective of resource allocation in understanding China's economic growth, the land factor in China still has many distortions compared to the capital and labor factors, which are the key constraints to economic development [4]. Because the efficiency of capital and labor allocation is mainly determined by the "invisible hand" of the market in resource allocation, while the government monopolizes the primary market and the spatial immobility of the land factor, the improvement of the efficiency of land resource allocation requires more top-level design. Therefore, land factors are more dependent on the "visible hand" of the government to achieve optimal allocation [5]. Government intervention in

land prices is the root cause of distortions in land factor [6]. Unlike Japan and France, where land prices are directly determined by land planning, and the United States and Canada, where land prices are determined by the free market, China's land market is characterized by a government-monopolized primary market and a free-floating secondary market. The former occupies a large proportion of the market and the proportion of the latter one is relatively small, making local governments have a strong ability and willingness to intervene in land transactions [7]. However, with the deepening of government-led economic development, urban land resources are becoming increasingly scarce [8]. Land, as the most important and scarce resource in a region, gradually becomes an important factor affecting regional economic development. Therefore, under the new situation of improving the quality of economic development and increasing land resource constraints, how to achieve the optimization of resource allocation and quality improvement of development through policy guidance is one of the focal issues of concern and debate in the current academic and policy level.

The influence of land policy on economic development has been well studied in the academic world. Nichols (1970) [9] is the first to suggest the important role of land in economic growth. Scholars in various countries have conducted studies related to the impact of land policies on regional economies. Ducourtieux et al. [10] studied of land reform policies in Laos and found that the state intervened in land distribution, a process that would protect village land in some areas. Buitelaar et al. [11] explored the impact of some instrumental changes in land policy on the development of urban areas using two cases from the Netherlands. Gils et al. [12] researched of West-Tyrolean commons regarding the number of farms with pastoral rights is declining problem at District and State level and found out that land policy and land administration are crucial. In China, some scholars have conducted studies on the relationship between land market and economic growth and confirmed that the effective market allocation of land plays an important role in economic growth [13–15], and that the contribution of land factor to China's economic growth can reach 20–30% [16–21]. In addition, the differentiation of land policy will give more land targets to the lagging regions and give local governments more opportunities to grant land through neighborhood plans, thus creating a more obvious "land finance", which, in turn, promotes local economic growth [22]. Tan et al. (2012) [23] show that the contribution of land inputs to China's economic growth is 36.63%. The marketization of land concessions is conducive to improving the efficiency of land resource allocation, thus promoting economic development [3,24]. The tilting of land supply to backward regions can, to a certain extent, alleviate the one-way transfer of labor from backward regions to developed regions, thus promoting economic development with the positive stimulation of labor and production factors [25]. China has introduced a series of macro-regional policies in an attempt to narrow the economic gap between regions, and one of the important policies is the preferential land policy favoring the central and western regions [26].

However, there is controversy in academia about the performance of land policy differentiation. Tang et al. (2018) [27] establish the logic of analysis of land finance, real estate economic dependence, and individual household wealth benefits and argue that land finance exacerbates the uneven distribution of social wealth. Li (2010) [17] finds that the government acquires more opportunities to transfer land while underpricing land resources due to the pursuit of performance and supplementation of the fiscal gap, which results in inefficient use of land and is detrimental to the economic development of backward regions. Du et al. (2017) [28] examine the impact of government intervention on land resource mismatch and find that the government distorts industrial land prices to transfer industrial land at low prices while offering commercial and residential land at higher prices, which leads to a mismatch of land resources between industrial and service industries. Based on the above literature, it can be seen that scholars have provided comprehensive insights on how to promote the optimal allocation of land among sectors, regions, and industries, but there is controversy on whether land policies can promote regional economic development; therefore, what is the impact of the reallocation of differentiation land policies adopted

by the government on economic efficiency? Can it have an impact on regional economic development? What is that impact? These questions are in urgent need of discovery and answers. It is through answering these questions that this paper seeks to fill the gap in the academic community regarding the impact of differential land policies on regional economic development.

The Chinese government has been committed to promoting the optimal development of resources through land policies. In March 2018, the General Office of the State Council issued the Measures for the Management of Inter-provincial Transfer of the Savings Indicators for Increasing and Reducing the Linkage of Urban and Rural Construction Land, which clearly deploys the inter-regional transfer of construction land indicators, with the aim of matching the amount of construction land actually needed for economic development between regions through the spatial reallocation of land indicators, thereby improving the overall efficiency of land resources utilization. Therefore, this paper treats the pilot cross-regional transfer of construction land indicators as an exogenous policy shock and examines the impact of this differentiation policy on regional economic development using the synthetic difference-in-differences model SDID. First, prefecture-level city panel data are used to estimate the economic growth effects of the policy on prefecture-level cities in the three regions and three states and on prefecture-level cities in the west that are not within the three states and three regions; second, the effect of the policy on the degree of balanced economic development in the three regions and three states provinces is examined based on the per capita GDP Theil index at the prefecture level.

The purpose of this study is to investigate the impact of this policy on the economic development of impoverished areas in depth. To this end, we treat the cross-regional transfer of construction land quotas as an exogenous policy shock and employ the synthetic difference-in-differences method developed by Arkhangelsky (2021) [29] to estimate the policy effect. This method has more evident advantages in robustness and estimation accuracy compared to the traditional difference-in-differences method. First, we use conventional Gross Domestic Product (GDP) as the dependent variable to measure the economic growth effect brought by the policy. Moreover, to gain a comprehensive understanding of the policy's impact on the economic development of impoverished areas, we further analyze the degree of economic development equilibrium and explore the specific manifestations of policy effects. Through this research, we hope to provide valuable insights for the economic development policies of impoverished areas in other countries and regions and propose specific policy recommendations.

The marginal contributions of this paper are as follows. First, this paper adds to the empirical research on the impact of land policy differentiation on regional economic differences in China and contributes to poverty reduction. Second, the findings of this paper provide a theoretical basis for further deepening the cross-regional construction land index transfer, which has a strong policy reference value. Third, the research of this paper provides a new way to narrow the income gap. This paper contains the following sections: The second section presents the theoretical analysis and the research hypotheses of this paper; the third section provides the research design of this paper and the definition of core variables; the fourth section shows the analysis of regression results; and the last section presents the conclusion and countermeasure suggestions.

# 2. Theoretical Analysis and Research Hypotheses

#### 2.1. Government Differentiated Policies and Regional Economic Growth

Research on the relationship between resource factor allocation and economic development has been the focus of academic attention. However, there are relatively few studies focused on land factor allocation compared to capital and labor, and the existing studies have mainly focused on agricultural land [30]. Duranton et al. (2015) [31] point out that the mismatch of land resource brings efficiency losses to the Indian economy; in addition, the intra-urban and inter-urban land mismatches have different causes; therefore, different policy recommendations are needed to correct these mismatches. According to urban economics theory, conducting land use regulation is necessary to internalize the negative externalities of the spatial agglomeration of population and economic activities, which can correct market failures [32–35]. From the perspective of coordinated regional development, the allocation of land resources is presented as the allocation of construction land indicators between regions [1]; a city's productive strengths and competitiveness can be enhanced by introducing policies to improve overall connectivity [36]. Under the Chinese land system, the government dominates the allocation of land resources as the supplier and manager of construction land indicators [37]. This requires macroeconomic regulation by the government through administrative, legal, and economic means based on market mechanisms, and local government intervention in the land supply structure affects the land supply strategies of neighboring regions [38].

The impacts of government-differentiated policies on the economy are reflected in the following three aspects.

Firstly, institutional support for land is an important factor in ensuring sustainable development and poverty eradication [39,40]. The policies are introduced to bring about possible economic growth effects on the one hand; and on the other hand, they are also expected to solve the problem of poverty eradication in deep poverty areas in the west, which is a concrete manifestation of the goal of common prosperity in the field of land policy.

Secondly, when the competition among local governments is mainly "competition for welfare", the higher industrial tax revenue generated by the differentiated allocation of land resources in the industrial sector can motivate local governments to increase the provision of public services and improve the welfare level of residents [41]. It can be seen that the differentiated allocation of land resources can not only promote economic growth, provide more employment opportunities for residents, improve their income levels through tax effects, capital accumulation, and industrial restructuring, but also increase local governments' fiscal revenues and provide abundant financial support for improving the construction of regional public services and other infrastructure projects [42–44].

Thirdly, less developed regions have received funds for poverty alleviation while transferring out construction land indicators [45]. The reality is that less developed regions with high land resource stocks lack development funds, while the exuberant land demand in developed regions is not met. This makes a huge land price difference between regions, but the lack of effective mechanisms to help poor rural development in the west is in a state of lack. Therefore, allowing construction land indices to be transferred across provinces precisely creates conditions for raising funds for rural revitalization and rural poverty alleviation from an institutional perspective [46]. For poor regions with a relative abundance of construction land, this initiative allows land to generate greater benefits in exchange for much-needed funds for poverty alleviation [47].

Combined with the above analysis, it can be seen that expanding the radius of land transfer from intra-provincial to cross-provincial areas and allocating land elements on a larger spatial scale not only directly broaden the source channels for poverty alleviation funds but also increase the total amount of funds supporting poor rural areas, which is important for increasing rural per capita income [48]. In addition, the effect of poverty alleviation is direct and effective because the central government clearly stipulates that most of the transferred funds are used for poverty alleviation in deeply impoverished areas. Based on the above analysis, the following assumption is proposed:

**Hypothesis 1.** *Government-differentiated cross-regional construction land index transfers can simultaneously promote regional economic growth.* 

# 2.2. The Extent to Which Government-Differentiated Land Policies Are Balanced with Economic Development

The unevenness of China's land resource endowment and economic efficiency is more often reflected between different provinces, which determines that the mismatch between land supply and demand will also occur more often between provinces. The land supply differentiation policy has been implemented in such a way that the share of land supply in the more backward regions of central and western China has increased year by year, while relatively less land supply targets have been allocated to relatively more developed regions, with the policy intention of narrowing the gap in economic development between China's regions. However, scholars have found that the land policy does not narrow the development gap between regions, and Lu Ming (2011) [49] points out that the construction land targets are allocated more to the central and western regions after 2003, which lead to a decrease in land use efficiency. Fang et al. (2021) [50] use a spatial general equilibrium model to quantify the impact of the mismatch of construction land targets between regions on China's economic growth and conclude that the mismatch reduces productivity and total output at the national level by 7.3% and 2.4%, respectively. The fiscal expenditure effect created by land finance shows an inter-regional imbalance in the promotion of economic development [27].

The reasons why the land-differentiated policy fails to achieve the goal of balanced regional development are mainly reflected in the following three aspects.

Firstly, developed regions have the advantages of developed economy and strong population absorption capacity and are in a favorable position to attract investments such as real estate development, which inevitably results in the flow of social investment capital and social wealth to developed regions (Dong Kuijun, 2023) [51]. Less developed regions are unable to attract more social capital entry and investment from real estate developers due to their poor infrastructure conditions and imperfect social public service facilities, and the regional economy develops more slowly. The gap between the two in the regional economic development is becoming bigger and bigger [52].

Secondly, because local fiscal revenue is mainly used for future economic development investment, fiscal revenue and expenditure have a very important role in regional economic development. Land fiscal revenue, as a very important component of local fiscal revenue, will have an important impact on local investment and economic development [53]. From the perspective of differences in land finance revenues and expenditures of different regional governments, developed regions have a higher overall level of land finance revenues due to their location and economic development base advantages, and the government, as the "economic leader", has relatively sufficient funds for economic development (Zhang, 2022) [54]. The government, as the "economic leader", has relatively sufficient funds for economic development funds for economic investment and infrastructure construction, which can better play a financial role in economic development (Zhang, 2022) [54]. The government, as the "economic leader", has relatively sufficient funds for economic investment and infrastructure construction, and is able to play a better role in fiscal development [54]. On the contrary, less developed countries have very limited land revenue due to their geographical location and economic development disadvantages, which makes it difficult to play the role of finance for economic and social development more effectively.

Thirdly, due to the alienation of government transfers after the tax sharing reform, the central government transfers to localities are mainly undertaken through tax rebates, and the amount of transfers that localities receive from the central government depends on the actual amount of revenue in the base period year rather than the difference between the financial needs required to perform their functions and their own income levels [55]. The more developed a local economy is, the more revenue it has in the base period; and the faster the growth of the "two taxes", the more transfer payments it receives, and vice versa [56]. This approach distorts the function of the transfer payment system to compensate for the imbalance of economic development among regions and makes the transfer payment system unable to perform the function of narrowing the gap of regional income levels, but leads to the expansion of regional income imbalance, which, in turn, aggravates the imbalance of financial income and expenditure among regions.

Based on the above analysis, the following assumption is proposed:

**Hypothesis 2.** Differentiated land policies can affect the degree of balanced economic development.

# 3. Study Design and Description of Variables

# 3.1. Study Design

In March 2018, the General Office of the State Council issued the "Management Measures for Cross-Province Transfer of Savings Indicators for Urban and Rural Construction Land Increases and Decreases" (State Office [2018] No. 16), which officially launched a pilot program for cross-regional transfer of construction land indicators. The pilot period is three years, (valid until the end of 2020), the pilot area is "three regions and three states" area. Of the three regions and three states, "three regions" refers to the (1) Tibet Autonomous Region (2) Four Tibetan areas in Qinghai, Sichuan, Gansu, Yunnan Province (3) Hotan region, Aksu region, Kashgar region, Kizilsu Kirgiz Autonomous Prefecture in southern Xinjiang.; "three states" refers to Sichuan Liangshan Prefecture, Yunnan Nujiang Prefecture, and Gansu Linxia Prefecture, see Figure 1. Three regions and three states within the prefecture-level cities and prefecture-level areas are as follows: Sichuan Aba Tibetan and Qiang Autonomous Prefecture, Sichuan Ganzi Tibetan Autonomous Prefecture, Sichuan Liangshan Yi Autonomous Prefecture, Yunnan Nujiang Lisu Autonomous Prefecture, Yunnan Diqing Tibetan Autonomous Prefecture, Gansu Linxia Hui Autonomous Prefecture, Gansu Gannan Tibetan Autonomous Prefecture, Qinghai Haibei Tibetan Autonomous Prefecture, Qinghai Huangnan Tibetan Autonomous Prefecture, Qinghai Hainan Tibetan Autonomous Prefecture, Qinghai Guoluo Tibetan Autonomous Prefecture, Qinghai Yushu Tibetan Autonomous Prefecture, Qinghai Yushu Tibetan Autonomous Prefecture, Qinghai Haixi Tibetan-Mongolian Autonomous Prefecture, Xinjiang Kizilsu Kirgiz Autonomous Prefecture, Xinjiang Aksu Region, Xinjiang Kashgar Region, Xinjiang Hotan Region, and six prefecture-level cities under the jurisdiction of Tibetan Province, a total of 23 areas.



**Figure 1.** Map of three regions and three states. The yellow, blue, and red parts are the three areas; the green part is the three states.

This policy context provides a fitting quasi-natural experiment by which to evaluate the economic impact of cross-regional transfer of construction land targets, which can be considered as an exogenous shock. In the empirical analysis of estimating policy effects, the difference-in-differences (DID) method is a common approach, with reference to Arkhangelsky et al. (2021) [57], who introduce the latest synthetic difference in differences method (synthetic DID) to estimate the economic growth effect and the pro-poor effect of the policy separately. The synthetic DID (SDID) method combines the advantages of both traditional difference-in-differences and synthetic control methods. It explores how to construct a control group that better aligns with the parallel trend test using the synthetic control approach, resulting in a more robust and accurate estimator. The average treatment effect of the policy can be derived from the following equation:

$$\hat{\tau}^{sdid} = \operatorname*{argmin}_{\mu,\alpha,\beta,\gamma} \{ \sum_{i=1}^{N} \sum_{t=1}^{T} (Y_{it} - \mu + \alpha_i + \beta_t + \tau DID)^2 \hat{\omega}_i^{sdid} \hat{\lambda}_t^{sdid} \},$$
(1)

where  $Y_{it}$  it is the dependent variable,  $\mu$  is the constant term,  $\alpha_i$  is the individual fixed effect,  $\beta_t$  is the time fixed effect, and *DID* denotes the interaction term between the time dummy and the grouping dummy in the difference-in-differences model.  $\hat{\omega}_i^{sdid}$  is the weight applied to  $Y_{it}$  before the policy implementation, and  $\hat{\lambda}_t^{sdid}$  is the time weight.

#### 3.1.1. Model of Hypothesis 1

Specifically, to investigate whether the policy can stimulate GDP growth in the three regions and three states, prefecture-level cities and prefecture-level regions within the three states and three regions are selected as the treatment group, and prefecture-level cities within the western provinces which are not affected by the policy and do not belong to the three states and three regions serve as the control group. We constructed the following econometric model to test the assumptions outlined above:

$$\ln GDP_{it} = \alpha_0 + \alpha_1 DID_{it} + \alpha_2 CV_{it} + City_i + Year_t + \varepsilon_{it}, \tag{2}$$

where  $\ln GDP_{it}$  it is the explanatory variable,  $DID_{it}$  represents the interaction term between the time dummy and the grouping dummy in the difference-in-differences model,  $CV_{it}$ is a set of control variables related to GDP,  $City_i$  represents individual fixed effects,  $Year_t$ represents time fixed effects, and  $\varepsilon_{it}$  is a stochastic disturbance term.

# 3.1.2. Model of Hypothesis 2

To further investigate the effect of policies on the equilibrium state of regional economic development in the three regions and three states, we categorized these areas into four groups based on geographical location. We then calculated the regional-level Theil index using GDP per capita as the explanatory variable, measuring the equilibrium state of regional development, referring to Huang and Wang (2000) [58] and Hu and Ou (2007) [59].

The Theil index was introduced by Theil in 1967 as a coefficient to measure intraregional differences. In this study, we employ the ungrouped Theil index to assess the balanced development between prefecture-level cities and prefecture-level regions within a specific area, using the following formula:

$$Theil = \frac{1}{n} \sum_{i} \left(\frac{y_i}{\overline{y}}\right) \ln\left(\frac{y_i}{\overline{y}}\right). \tag{3}$$

In the above equation, *n* represents the number of prefecture-level cities and prefecture-level regions within the region, *i* denotes the number of regions, and *y* stands for GDP per capita. The Theil index is used as the explanatory variable in the following equation:

$$\Gamma heil_{it} = \alpha_0 + \alpha_1 DID_{it} + \alpha_2 CV_{it} + Area_i + Year_t + \varepsilon_{it}, \tag{4}$$

where  $Theil_{it}$  is the explained variable,  $DID_{it}$  denotes the interaction term between the time dummy and the grouping dummy in the difference-in-differences model,  $CV_{it}$  is a set of control variables related to GDP,  $Area_i$  represents individual fixed effects,  $Year_t$  represents time fixed effects, and  $\varepsilon_{it}$  is a stochastic disturbance term. At this point, the treatment group consists of four subgroups (Xinjiang region, Sichuan and Yunnan region, Qinghai and Gansu region, and Tibetan province) divided within the three states and three regions, see Figure 2. The control group comprises the per capita GDP Theil index of other western provinces (excluding Qinghai, as only two prefecture-level cities are left in Qinghai Province, apart from the Tibetan Autonomous Prefectures).



**Figure 2.** The yellow part is the Xinjiang region; the green part covers the Sichuan and Yunnan region; the red part covered the Qinghai and Gansu region; and the blue part is Tibetan province.

This paper proceeds along the following research steps.

(1) Data Collection

Our data were collected from CEIC database, the China Urban Statistical Yearbook, and the China Ethnic Statistical Yearbook, which contains a total of ten years of data from 2011–2020. The software tool for data collection is Microsoft Excel 2021, which was acquired through personal purchase, developed by Microsoft Corporation.

(2) Data Preprocessing

Missing values are completed using interpolation method.

(3) Model Building

We establish the SDID model to estimate policy effect by using GDP and the Theil index as dependent variables (see Figure 3). The software tool is Stata 17.0, which was acquired through personal purchase, developed by StataCorp LLC. To achieve this model, we used "sdid" command. As for better graphs, we used R package "synthdid" in RStudio, an open-source integrated development environment for R, which was downloaded from their official website.

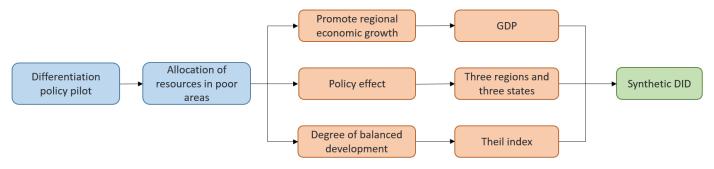


Figure 3. Flowchart for the study on the differentiation policy pilot.

(1) Robustness Check

To prove the robustness of our results, we used the following methods: parallel trend test, placebo test by changing the time of occurrence of the policy shocks, placebo test by randomly selecting a pseudo-treatment group, and alternative metrics for core variables.

# (2) Result Interpretation

Through the analysis of the level of economic development and the degree of economic development equilibrium, we explain the policy effect according to the results of the model. The explanatory process is mainly based on statistical significance and economic theory.

# 3.2. Descriptive Statistics

# 3.2.1. Dependent Variable

The dependent variable is the level of economic development, measured as the logarithm of the GDP of the prefecture-level city or lower region (lnGDP). To further examine the effect of land differentiation on intra-regional disparities, the Theil index (Theil) calculated as GDP per capita for prefecture-level cities and prefecture-level regions was used as a replacement explanatory variable, and the values of the Theil index are specified in Table 1.

Year	Chuan-Yun Area	Qing-Gan Area	Xinjiang Area	Tibet
2011	0.0331	0.4023	0.1000	0.1144
2012	0.0334	0.4056	0.1023	0.1219
2013	0.0331	0.3873	0.0987	0.1277
2014	0.0347	0.3285	0.0862	0.1223
2015	0.0361	0.2324	0.0631	0.1081
2016	0.0369	0.2423	0.0664	0.1064
2017	0.0376	0.2679	0.0749	0.0769
2018	0.0371	0.3186	0.0758	0.0948
2019	0.0324	0.3077	0.0701	0.0987
2020	0.0345	0.3259	0.0695	0.0891

Table 1. Theil index values by region.

# 3.2.2. Independent Variable

The core independent variable DID is the interaction term of the grouping dummy variable (treat) and the time dummy variable (post): treat takes the value of 1 when a region falls within the tri-state tri-region and 0 vice versa; post takes the value of 1 when the years are 2018, 2019, and 2020 and 0 vice versa.

# 3.2.3. Control Variables

Referring to Zheng et al. (2014) [60] and Li Shigang and Yin Heng (2017) [61], the control variables are selected as industrial structure, resident productivity development, government size, and education development level. Industrial structure (Indus) refers to the following: the proportion of the output value of secondary industry to regional GDP (Indus2) and the proportion of the output value of tertiary industry to regional GDP (Indus3), measuring the regional industrial structure; resident productivity (InperGDP): the logarithm of GDP per capita measures the development of regional resident productivity; government size (Ingov) is measured by government fiscal expenditure (Ingovin) and government revenue (Ingovout) to measure the size of regional government; education development level (presch) is introduced to measure the level of education development by the number of regional elementary school, taking into account the relatively backward education development status of the three regions and three states.

# 3.2.4. Data Sources and Descriptive Statistics

The data contain a total of ten years of data from 2011–2020, and some missing values are completed using the interpolation method, where 2018 is the time point when the policy occurred. The data in this paper are obtained from the CEIC database, the China Urban Statistical Yearbook, and the China Ethnic Statistical Yearbook. The descriptive statistics of the relevant variables are shown in Tables 2 and 3.

Variable Type	Variable Name	Code	Obs	Mean	Std. Dev.	Min	Max
Dependent variable	Economic Development Level	lnGDP	1120	0.0616	0.2405	0	1
Independent variable	endent variable Cross product terms for dummy variables and time dummy variables		1120	4.2323	1.1069	0.9609	7.8242
	Share of secondary industry output in regional GDP	industry2	1120	0.4266	0.1251	0.0515	0.8934
Control variables	Share of tertiary industry output in regional GDP	industry3	1120	0.4207	0.1097	0.1015	0.7264
-	Government Financial Spending	lngovin	1120	8.4841	1.1927	4.8330	12.3307
-	Government revenue	lngovout	1120	9.9591	0.7373	7.4256	13.1009
-	Education Development Level	presch	1120	515.4683	544.0674	15	5248

Table 2. Descriptive statistics corresponding to the econometric model (1).

Table 3. Descriptive statistics corresponding to the econometric model (3).

Variable Type	Variable Name	Code	Obs	Mean	Std. Dev.	Min	Max
Dependent variable	Dependent variable Theil index		140	0.0857	0.2809	0	1
Independent variable	ependent variable Cross product terms for dummy variables and time dummy variables		140	0.1120	0.0785	0.0224	0.4056
	Share of secondary industry output in regional GDP	industry2	140	0.4237	0.1074	0.2031	0.7997
	Government Financial Spending	industry3	140	0.4644	0.0650	0.2600	0.5825
Control variables	Government Financial Spending	lngovin	140	12.1198	1.4557	8.7593	14.0995
	Government revenue	lngovout	140	12.4157	0.7425	10.9674	13.9287
	Education Development Level	presch	140	4783.214	3884.064	724	1378

# 4. Regression Analysis

# 4.1. Economic Growth Effects of Differentiated Land Policies

According to the regression Equation (2), the promotion effect of the inter-provincial transfer of construction land index policy on the economic development of the three regions and three states was estimated, and the results are shown in Table 4 below. It can be seen that the *p*-value in row (1) is significantly positive to the extent of 1%, and in row (2), after adding the control variables, the *p*-value is still significantly positive to the extent of 5%, which indicates that the policy can promote the economic growth of the three regions and three states area.

Table 4. Equation (1) regression results.

	ATT	Std.Err	t	P >  t	Obv	Control-Variable
(1)	0.07246	0.02141	3.38	0.001	1120	No
(2)	0.04981	0.02004	2.44	0.015	1120	Yes

Figure 4 shows the trend plot of the econometric model (1), where the blue line is the treatment group, and the red line is the control group after synthesis. The points in the figure are the observations at the end of the year, the black vertical line at 2017 is drawn for the convenience of observing the trend of changes after the policy occurred in 2018, and the trend of changes within each year after the policy occurred is more intuitively reflected by the three dashes from 2017–2018, 2018–2019, and 2019–2020. It can be observed from the figure that the log GDP of the treatment group shows an overall upward trend within three years after the occurrence of the policy. The lower red area represents the time weights  $\lambda$ .

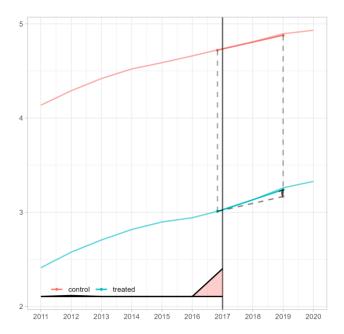
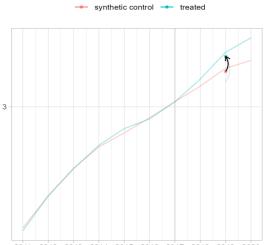


Figure 4. Trend plots for the control and synthetic control groups of the measurement model (1).

The difference between the treatment and control groups can be better observed by panning the two curves together in Figure 5, where the dark arrows indicate the lower boundary of the treatment effect, and the lighter arrows indicate the upper boundary of the treatment effect. After overlapping, it can be observed that before 2018, the GDP of prefecture-level cities and prefecture-level regions within the three regions and three states, as well as prefecture-level cities within other western provinces, are in a stable upward trend; while after 2018, the slope of the treatment group is significantly higher than that of the synthesized control group, indicating that after the implementation of the policy, the GDP of prefecture-level cities and prefecture-level regions within the three regions and three states area, compared to other western provinces' prefecture-level cities, have a significant increase, which is consistent with the results of the regression analysis.



2011 2012 2013 2014 2015 2016 2017 2018 2019 2020

Figure 5. Trend graph of control and synthetic control groups after curve panning.

Figure 6 shows the trend plot of the 20 regions with the largest weights in the control group used for synthesis, and it can be observed that the 20 prefectures with the largest weights are in a stable upward trend before 2018; while after 2018, the slope of the treatment group is slightly higher than that of the synthesized control group. Figure 7 shows the

individual contributions of these 20 regions when the control group is synthesized, showing the contribution of each control individual, with the dark middle line representing the estimated treatment effect and the top and bottom two light-colored lines showing the 95% confidence interval of the treatment effect.

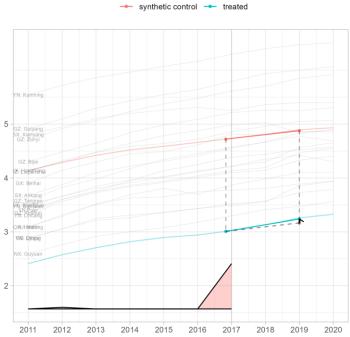


Figure 6. Trend graph of the 20 regions with the highest weights in the control group.

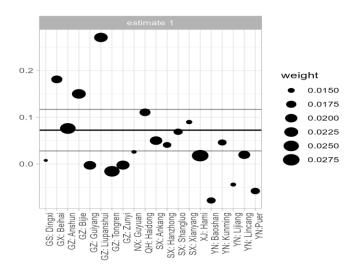


Figure 7. Map of individual contributions of the 20 regions with the highest weights in the control group.

# 4.2. Preferential Land Policy Affects the Equilibrium Degree Effect of Economic Development

Based on the regression Equation (3) and the Theil's index Formula (2), the impact of the inter-provincial transfer of construction land index policy on the degree of balanced economic development in the three regions and three states was estimated, and the results are shown in Table 5 below. It can be seen that the *p*-value in row (1) is significantly positive at 5%, and in row (2), after adding the control variables, the *p*-value is significantly positive at 10%, which indicates that the policy can lead to a significant increase in the Theil index of GDP per capita in the three regions and three states compared to other provinces in the west. This means that the level of development balance is lower in the three regions and three states area compared to other provinces in the west.

Table 5. Equation (2) regression results.

	ATT	Std.Err	t	P >  t	Obv	Control-Variable
(1)	0.0187	0.0088	2.13	0.033	140	No
(2)	0.0907	0.0512	1.77	0.076	140	Yes

Figure 8 shows the trend plot of the econometric model (2), where the blue line is the treatment group, and the red line is the control group after synthesis. In Figure 9, the two curves are panned together to better observe the difference between the treatment and control groups, where the dark arrows indicate the lower boundary of the treatment effect and the lighter arrows indicate the upper boundary of the treatment effect. From the figure, it can be observed that before 2018, the Theil indices of both the three regions and the other western provinces are in a steady decline; after 2018, the level of the Theil coefficient of the control group is significantly higher than that of the synthetic control group, which indicates that the development level of the three regions and the three states is more uneven compared to the other western provinces after the policy implementation, which is consistent with the results of the regression analysis. This is consistent with the results of the regression analysis. The reason for this may be that the three regions and states are currently out of extreme poverty and have entered the primary stage of economic development, which is also in line with the inverted "U" theory of regional economic development proposed by Williamson (1965) [62]; that is, in the early stages of economic development, as the economic level gradually increases, the development differences between regions will further increase.

Figure 10 shows the trend plot of the 5 provinces with the largest weights in the control group used for synthesis. Figure 11 shows the individual contributions of these 5 provinces when the control group is synthesized, showing the contribution of each control individual, with the dark middle line representing the estimated treatment effect and the top and bottom two light-colored lines showing the 95% confidence interval of the treatment effect.

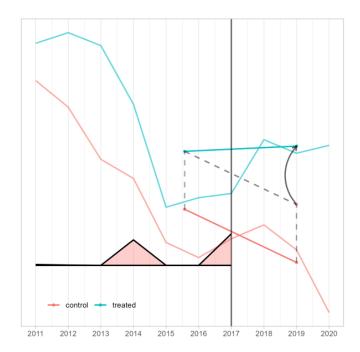


Figure 8. Trend plots for the control and synthetic control groups of the econometric model (2).

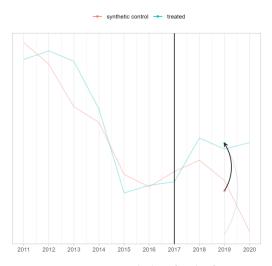
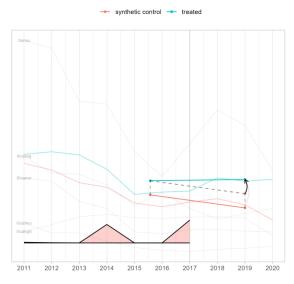
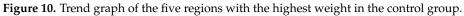
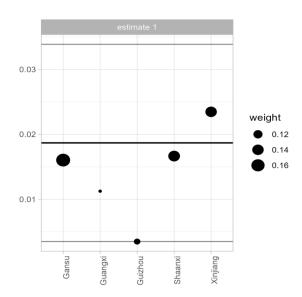


Figure 9. Contains trend plots for the five provinces with the highest weights in the control group.







**Figure 11.** Individual contribution map of the five regions with the highest weights in the control group.

# 4.3. Robustness Tests

# 4.3.1. Parallel Trend Test

A prerequisite for the use of DID is that the parallel trend assumption is satisfied; that is, the treatment and control groups should have approximately the same trend prior to the onset of the policy shock. If the treatment and control groups have different trends prior to the policy, then it is impossible to fully determine whether the difference between the two groups after the policy occurs is entirely due to the policy or not. The control group fitted by SDID, which is developed based on DID, naturally needs to satisfy this assumption as well. Referring to [7] we tested the parallel trend hypothesis better by plotting the trend of the treatment and control groups over time and shifting the two lines up and down so that they overlap as much as possible. As shown in Figures 2 and 6, the trends of the treatment and synthetic control groups largely overlapped before the policy occurred, satisfying the parallel trend test.

# 4.3.2. Placebo Test by Changing the Time of Occurrence of the Policy Shocks

Considering the three regions and three states as the key areas of poverty alleviation in China, in order to exclude the infection of other policies to a certain extent and improve the reliability of the conclusions of this paper, we conducted the following placebo test. Keeping the treatment and control groups unchanged, but changing the time of occurrence of the policy shocks by assuming them in periods t-2, t-3, and t-4, respectively, regression analysis was conducted again, and the results of the analysis are shown in Tables 6 and 7 below. It can be found that the regression coefficients in periods t-2, t-3, and t-4 are not significant, which indicates that the differences between the treatment and control groups are not caused by other policies before the occurrence of the policy shocks.

	ATT	Std.Err	t	P >  t	Obv
t-2	0.1212	0.3263	0.37	0.710	1120
t-3	0.03041	0.03953	0.77	0.442	1120
t-4	0.06073	0.04228	1.44	0.151	1120

 Table 6. Placebo Equation (1) regression results.

Table 7. Placebo Equation (3) regression results.

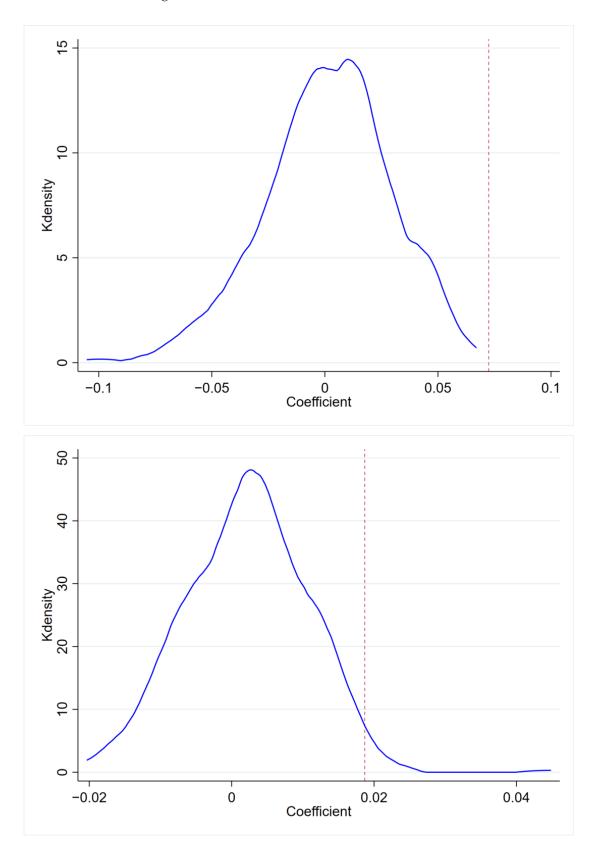
	ATT	Std.Err	t	P >  t	Obv
t-2	0.0132	0.0099	1.33	0.182	140
t-3	-0.0050	0.0078	-0.64	0.524	140
t-4	-0.0194	0.0155	-1.25	0.210	140

4.3.3. Placebo Test by Randomly Selecting a Pseudo-Treatment Group

To further examine the stability of our model, we reference existing research and conduct a placebo test by randomly selecting a pseudo-treatment group from the entire sample. We use the interaction term between the pseudo-treatment group and a dummy time variable as the new core explanatory variable for a Synthetic difference-in-differences regression, repeating this test 500 times. Figure 12 displays the kernel density plots for the treatment effects of the two models in our study. As evidenced by the concentration of treatment effects around 0, our econometric model demonstrates robustness. The red dashed line is ATT.

# 4.3.4. Alternative Metrics for Core Variables

In order to test the robustness of the regression results and to take into account the completeness of the data, the explanatory variable lnGDP in the econometric model (1) is changed to the logarithm of retail sales of consumer goods and re-run as a regression.



The results are presented in Table 8, which further enhances the reliability of the paper's findings.

Figure 12. Kernel density plots for the treatment effects of the two models.

	ATT	Std.Err	t	P >  t	Obv	Control-Variable
(1)	0.0888	0.0347	2.56	0.010	1120	No
(2)	0.0748	0.0399	1.87	0.061	1120	Yes

Table 8. Equation (1) replaces the regression results of the explanatory variables.

# 4.4. Discussion

4.4.1. Alleviating Poverty and Enhancing Economic Growth through Differentiated Land Policies

First and foremost, there is no doubt that the Chinese government has achieved remarkable accomplishments in its poverty alleviation efforts, drawing global attention. Over the past decade or so, the government has employed various approaches to promote rural revitalization, including the "Management Measures for Cross-Province Transfer of Savings Indicators for Urban and Rural Construction Land Increases and Decreases" studied in this paper. By selling surplus land indicators from impoverished regions to more developed provinces, the Chinese government has achieved resource redistribution, raising more funds for poverty alleviation in these areas, as evidenced by the significant increase in GDP in the three regions and three states.

# 4.4.2. Alleviating Poverty through Differentiated Land Policies

As the area with the highest poverty level in the country, the economic development in the three regions and three states is extremely uneven. In this area, there are regions such as the Haixi Tibetan Autonomous Prefecture, which relies on abundant natural resources to achieve a relatively high per capita GDP, and extremely impoverished areas such as the Liangshan Yi Autonomous Prefecture in Sichuan Province. This led to a highly uneven economic development in the three regions and three states around 2011, with a significantly higher Theil index than other western provinces. However, since the Chinese government has intensified its poverty alleviation efforts, this situation has been significantly improved, as evidenced by the rapid decline in the regional Theil index. Empirical results indicate that since the implementation of the policy in 2018, the Theil index in the three regions and three states has shown a significant growth trend compared to other western provinces. Given the achievements made by the government in poverty alleviation during the same period, we can consider the three regions and three states as areas that have escaped extreme poverty and entered an initial stage of economic development. This is consistent with the regional economic development "inverted U" theory proposed by Williamson (1965) [62], stating that in the early stages of economic development, as the economic level gradually improves, regional development disparities will further expand.

# 5. Conclusions and Policy Recommendations

# 5.1. Conclusions

This study analyzes the impact of the "Management Measures for Cross-Province Transfer of Savings Indicators for Urban and Rural Construction Land Increases and Decreases" policy on the three regions and three states from the perspectives of regional GDP and regional Theil index, drawing the following conclusions.

First, after comparing the prefecture-level regions in the three regions and three states with those in other western provinces, it is found that the implementation of the policy has significantly increased the GDP of the three regions and three states, and the policy effect is evident throughout the entire period after implementation.

Second, by calculating the Theil index for each group of prefecture-level regions in the three regions and three states based on geographic location and comparing it with the internal Theil index of other western provinces, it is found that since the policy's implementation in 2018, the Theil index in the three regions and three states has shown a significant growth trend compared to other western provinces, indicating that the development disparities within the three regions and three states are more significant than those in other western provinces.

This study also has some limitations. First, due to the poor infrastructure construction in the three regions and three states and limited available data, only GDP and the Theil index based on GDP are used as dependent variables in the empirical analysis model, and the data are limited to prefecture-level regions, which makes it impossible to obtain more detailed administrative unit data. This may affect the robustness of the empirical analysis. Second, this paper mainly focuses on the policy's impact on impoverished areas without estimating its effects on developed areas. It is hoped that these limitations can be addressed in future research.

# 5.2. Policy Recommendations

Based on the above contents, this study proposes the following policy recommendations.

Firstly, the diversification and comprehensiveness of policies have significantly strengthened government intervention, and the synergy between policies has enhanced their effectiveness. Other developing countries can learn from China's poverty alleviation experience and formulate multi-level, targeted policies for different regions, industries, and groups, including investments in infrastructure, education, and healthcare resources, as well as industry support in impoverished areas, while at the same time, ensuring the synergy and complementarity between policies to improve policy implementation results.

Secondly, in terms of using the growth target to promote high-quality development, resources and policies should be appropriately tilted in areas where efficiency is a priority, and where the growth target needs to play a leading role; in areas related to the achievement of common prosperity, it is also necessary to allocate key resources and policies in a reasonable and fair manner according to local conditions.

Thirdly, the government can promote industrial restructuring and increase industrial added value through financial support, tax incentives, and technological research and development. Meanwhile, attention should be paid to the development of a green economy and the promotion of sustainable development.

Although this study focuses on China's three regions and three states, the conclusions can still be applied to many developing countries, especially those undergoing rapid development. During rapid development, urbanization and population mobility to urban areas can exacerbate resource allocation issues in urban areas. On the other hand, the suction effect of urban areas can lead to the loss of population and capital in surrounding rural areas. Targeted fiscal transfer policies (such as the one studied in this study) can alleviate these issues to a certain extent, ensuring the development of impoverished areas.

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